Claims

What is claimed is:

1. A cooling system comprising:

at least two modular cooling units (MCUs), each MCU being capable of providing system coolant to multiple electronics subsystems to be cooled; and

wherein each MCU of the at least two MCUs comprises a heat exchanger, a first cooling loop with at least one control valve, and a second cooling loop, and wherein when an MCU of the at least two MCUs is operational, the first cooling loop receives chilled facility coolant from a source and passes at least a portion thereof through the heat exchanger, the portion being controlled by the at least one control valve, and the second cooling loop provides cooled system coolant to the multiple electronics subsystems, and expels heat in the heat exchanger from the multiple electronics subsystems to the chilled facility coolant in the first cooling loop, wherein the at least one control valve allows regulation of facility coolant flow through the heat exchanger, thereby allowing control of a desired temperature of system coolant in the second cooling loop for cooling the multiple electronics subsystems.

2. The cooling system of claim 1, wherein when the cooling system is operational, only one MCU of the at least two MCUs is operating to provide system coolant to the multiple electronic subsystems, with at least one other MCU of the at least two MCUs being in a standby mode.

3. The cooling system of claim 2, further comprising couplings associated with the at least two MCUs which allow each MCU to be removed while another MCU of the at least two MCUs is operational and providing system coolant to the multiple electronics subsystems.

4. The cooling system of claim 3, wherein each MCU comprises a pump for moving system coolant through the second cooling loop, and couplings on either side of the pump to allow for removal of the pump without requiring removal of the MCU.

5. The cooling system of claim 1, wherein the source of chilled facility coolant comprises a common source of chilled facility coolant supplied to the at least two MCUs.

6. The cooling system of claim 1, wherein the source of chilled facility coolant comprises a first source having a first input line and a first return line coupled to a first MCU of the at least two MCUs, and a second source having a second input line and a second return line coupled to a second MCU of the at least two MCUs.

7. The cooling system of claim 1, wherein the multiple electronics subsystems comprise multiple electronics racks comprising a computer room computing environment, wherein each MCU is capable of providing system coolant to cool the computer room computing environment.

8. The cooling system of claim 1, further comprising a controller for monitoring operation of the at least two MCUs and upon detection of a failure in one MCU of the at least two MCUs, for automatically switching to another MCU of the at least two MCUs to ensure continued cooling of the multiple electronics subsystems.

9. The cooling system of claim 8, further comprising electrically controllable shutoff valves coupled to each MCU and controllable by the controller for selectively directing chilled facility coolant flow through one of the MCUs of the at least two MCUs and for selectively directing system coolant from one of the MCUs of the at least two MCUs to the multiple electronics subsystems.

10. The cooling system of claim 1, wherein each MCU further comprises a system coolant expansion tank in communication with the second cooling loop, and wherein the system coolant expansion tanks of the at least two MCUs are connected in fluid communication to ensure that sufficient system coolant remains in the system coolant expansion tank of an operating MCU.

11. The cooling system of claim 1, wherein each MCU further comprises a system coolant expansion tank, and wherein the heat exchanger of each MCU is disposed within the MCU's system coolant expansion tank.

12. The cooling system of claim 11, wherein the heat exchanger of each MCU comprises a plate heat exchanger integrally disposed within the system coolant expansion tank.

13. A cooled electronics system comprising:

multiple electronics subsystems;

at least two modular cooling units (MCUs), each MCU being capable of providing system coolant to the multiple electronics subsystems to be cooled; and

wherein each MCU of the at least two MCUs comprises a heat exchanger, a first cooling loop with at least one control valve, and a second cooling loop, and wherein when the MCU is operational, the first cooling loop receives chilled facility coolant from a source and passes at least a portion thereof through the heat exchanger, the portion being controlled by the at least one control valve, and the second cooling loop provides cooled system coolant to the multiple electronics subsystems, and expels heat in the heat exchanger from the electronics subsystems to the chilled facility coolant in the first cooling loop, wherein the at least one control valve allows regulation of facility coolant flow through the heat exchanger, thereby allowing control of temperature of system coolant in the second cooling loop for cooling the multiple electronics subsystems.

14. The cooled electronics system of claim 13, wherein when the cooled electronics system is operational, only one MCU of the at least two MCUs is operating to provide system coolant to the multiple electronics subsystems.

15. The cooled electronics system of claim 14, further comprising couplings associated with the at least two MCUs which allow each MCU to be removed while another MCU of the at least two MCUs is operational and providing system coolant to the multiple electronics subsystems.

16. The cooled electronics system of claim 15, wherein each MCU comprises a pump for moving system coolant through the second cooling loop, and couplings on either side of the pump for allowing removal of the pump without requiring removal of the MCU.

17. The cooled electronics system of claim 13, wherein the source of chilled facility coolant comprises a first source having a first input line and a first return line coupled to a first MCU of the at least two MCUs, and a second source having a second input line and a second return line coupled to a second MCU of the at least two MCUs.

18. The cooled electronics system of claim 13, wherein the multiple electronics subsystems comprise multiple electronics racks which together comprise a computer room computing environment, wherein each MCU of the at least two MCUs is capable of providing system coolant to cool the computer room computing environment.

19. The cooled electronics system of claim 13, further comprising a controller for monitoring the at least two MCUs and upon detection of a failure in one MCU of the at least two MCUs, for automatically switching to another MCU of the at least two MCUs to ensure continued cooling of the multiple electronics systems.

20. The cooled electronics system of claim 19, further comprising electrically controllable shutoff valves coupled to each MCU and controllable by the controller for selectively directing chilled facility coolant through one of the MCUs of the at least two MCUs and for selectively directing system coolant from one of the MCUs of the at least two MCUs to the multiple electronics subsystems.

21. The cooled electronics system of claim 13, wherein each MCU further comprises a system coolant expansion tank in communication with the second cooling loop, and wherein the system coolant expansion tanks of the at least two MCUs are connected in fluid communication to ensure that sufficient system coolant remains in the system coolant expansion tank of an operating MCU.

22. The cooled electronics system of claim 13, wherein each MCU further comprises a system coolant expansion tank, and wherein the heat exchanger of each MCU is disposed within the MCU's system coolant expansion tank.

23. The cooled electronics system of claim 22, wherein the heat exchanger of each MCU comprises a plate heat exchanger integrally disposed within the system coolant expansion tank.

24. A method for cooling multiple electronics subsystems, the method comprising:

providing at least two modular cooling units (MCUs), each MCU being capable of providing system coolant to multiple electronics subsystems to be cooled, wherein each MCU of the at least two MCUs comprises a heat exchanger, a first cooling loop with at least one control valve, and a second cooling loop with system coolant;

providing, for a selected MCU of the at least two MCUs, chilled facility coolant to the first cooling loop from a source and passing at least a portion thereof via the at least one control valve through the heat exchanger;

providing, for the selected MCU of the at least two MCUs, cooled system coolant from the second cooling loop to the multiple electronics subsystems, and expelling heat in the heat exchanger from the multiple electronics subsystems to the chilled facility coolant in the first cooling loop; and

wherein the at least one control valve of the selected MCU allows regulation of facility coolant flow through the heat exchanger, thereby allowing control of temperature of the system coolant in the second cooling loop for cooling the multiple electronics subsystems.

25. The method of claim 24, further comprising cooling the multiple electronics subsystems employing only one MCU of the at least two MCUs, with the other MCU of the at least two MCUs being in a standby mode.

26. The method of claim 24, further comprising providing couplings associated with the at least two MCUs which allow each MCU to be removed while the other MCU of the at least two MCUs is operational and providing system coolant to the multiple electronics subsystems.

27. The method of claim 24, wherein the source of chilled facility coolant comprises a first source having a first input line and a first return line coupled to a first MCU of the at least two MCUs, and a second source having a second input line and a second return line coupled to a second MCU of the at least two MCUs, and wherein the method further comprises automatically switching operation between the first MCU and the second MCU upon detection of a leak in an input line or a return line.

28. The method of claim 24, wherein the multiple electronics subsystems comprise multiple electronics racks comprising a computer room computing environment, and wherein the method further comprises providing system coolant to cool the computer room computing environment from only one MCU of the at least two MCUs at a time.

29. The method of claim 24, further comprising monitoring operation of the at least two MCUs, and upon detection of a failure in one operating MCU of the at least two MCUs, automatically switching to another MCU of the at least two MCUs to ensure continued cooling of the multiple electronics subsystems.

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